

## REMARKS/ARGUMENTS

The Office Action of January 28, 2004, has been carefully considered.

It is noted that claim 10 is rejected under 35 U.S.C. §112, second paragraph.

Claims 1, 2, 4, 6, 10 and 24 are rejected under 35 U.S.C. §103(a) over the patent to Heimes et al., in view of the patent to Leachman, Jr., and further in view to the patent to Blackshear et al.

In connection with the Examiner's rejection of claim 10 as being indefinite, Applicant has amended this claim to provide antecedent basis for the piston rods. In view of these changes, it is respectfully submitted that this claim now particularly points out and distinctly claims the subject matter which Applicant regards as the invention. It is thus further respectfully submitted that the rejection of claim 10 under 35 U.S.C. §112, second paragraph, is overcome and should be withdrawn.

It is respectfully submitted that the claims presently on file differ essentially and in an unobvious, highly advantageous manner from the constructions disclosed in the references.

Turning now to the references, and particularly to the patent to Heimes et al., it can be seen that this patent discloses a pump assembly.

The patent to Leachman, Jr. discloses a heart assist device that uses a blood pump connected serially between the discharge of the heart ventricle and the vascular system.

The patent to Blackshear et al. discloses a jet pump cardiac replacement.

The Examiner combined these references in determining that claims 1, 2, 4, 6, 10 and 24 are unpatentable over such combination. As the Examiner acknowledges, all of these references deal with pumps which are provided to assist a weak heart. As mentioned in the last filed Amendment, the presently claimed invention deals with a device having a hydraulic motor. As previously mentioned, a hydraulic pump is a device that can make fluid flow from one point to another point by adding energy to the pump mechanism from an external source. In contrast, a hydraulic motor is a device that can convert the potential energy of the fluid set under pressure to kinetic energy. In short, a pump needs energy from an external source to exert its work on the fluid whereas a hydraulic motor utilizes energy from the fluid to create some type of mechanics. Thus, since none of these references deals with a hydraulic motor, Applicants submit that the

combination of references cannot teach the presently claimed invention. However, the references will be discussed to a greater degree below.

Blackshear et al. disclose a pump mechanism that is characterized by being a left to right shunt of the human circulation. By connecting some type of tubing from the high pressure section of the left heart via a jet pump housing, to the pulmonary artery (where the pressure is lower than on the left side), the blood pumping action of the heart is assisted. The pump mechanism differs in several ways when compared to the presently claimed invention. First, the pump of Blackshear et al., if properly installed and used, has a unidirectionally, slightly oscillating flow of blood from the left to the right heart. Only if incorrectly installed or used does a to and fro flow of blood from the left heart to the pump result, and in such a case the effect of the pump will be low, zero, or negative. In the presently claimed invention, a hydraulic motor using a to and fro flow mechanism is recited, and this is not taught by Blackshear et al.

Secondly, the pump of Blackshear et al. can only work from a high pressure area to a low pressure area. Thus, the pump cannot work from the right to the left side. Nor can it work from the left to the left side or from the right to the right side. In the present invention, a hydraulic motor utilizing a to and fro flow mechanism can work from any side of the circulation to any other side.

Thirdly, the pump of Blackshear et al. assists the right heart and results in a decreased workload of the right heart, but only by extracting even more energy from the opposite side. Such lost energy will result in a totally higher expenditure of energy of the heart. In the presently claimed invention, on the other hand, a hydraulic motor is defined that results in a totally lower energy consumption of the heart since lost energy is decreased due to after load reduction of the heart. This is described in detail in the specification of the present application. This after load reduction is unique for the presently claimed invention, and prior to the present invention could only be achieved by using drugs, which have other negative side effects.

Fourthly, the pump of Blackshear et al. has no gear mechanism. Thus, the pumping just continues depending on the pressure and flow conditions and the set up of the pump housing. The pump flow and characteristics are not adjustable for use with changing conditions over time. In the presently claimed invention, the hydraulic motor is connected to an executive organ via a gear mechanism so that the motor can change conditions of the entire unit over time when

needed or desired. The motor can also create a pressure higher than the original driving blood pressure depending upon the gear mechanism. Such results are impossible with a jet pump as taught by Blackshear et al. since there is no gearing.

Leachman, Jr. describes a blood pump connected to the aorta (after the heart in the direction of normal blood flow), or theoretically, on the right side of the heart (not illustrated). The energy for running the pump comes from an electric source outside the body. Basically, blood from the first part of the aorta is let into a pump housing. In the pump housing, a pusher plate moves left or right. The pusher plate is powered by an electric motor and its movements are adjusted by a servo electronic mechanism. One unidirectionally working valve guarantees that blood runs in the correct direction in an antigrade fashion. A ligation of the aorta is necessary from the pump mechanism. In the presently claimed invention, on the other hand, a hydraulic motor is described that by connection to an executive organ, via a gear mechanism, can operate without the addition of power from outside the body. The mechanism is based on changing the pump modus of the heart in a way that saves energy, not in a way that adds energy from the outside.

The patent to Heimes et al. discloses a pump for pumping blood or other liquids or gases. Blood is let into a pump housing from the circulatory system. In the pump housing, a pusher plate is actuated by an electric or pneumatic motor. The motor is powered from energy that is provided from outside the body. Thus, energy is added to the circulation from the outside via the motor that drives the hydraulic pump.

The Examiner combined these references in rejecting the presently claimed invention. Applicant respectfully submits that a combination of these references only results in a pump which requires external energy to be added. The presently claimed invention is directed to a hydraulic motor that brings pressurized blood from the heart into a cylinder thereby making the movement of a piston possible, and the motor then lets the blood return to the same compartment of the heart at a lower pressure. In other words, energy is tapped from the heart, not given to the heart as in the cited references.

By connecting the hydraulic motor to a second cylinder, as shown in Figure 8 of the present application, energy is transferred from the heart to the blood of the descending aorta later in each heart cycle. For the reasons described in detail in the specification of the originally-filed

application, this is better for the organism than conventional blood circulation. The combination of references, it is respectfully submitted, does not teach or suggest a hydraulic motor located outside the cardiovascular system of the organism and arranged to conduct at least part of the hydraulic fluid to and fro between the hydraulic motor and its connecting site to the organism, and/or between arteries and/or veins. Furthermore, the combination of references does not teach the additional feature that the executive organ has a pump powered by the hydraulic motor, which pump delivers hydraulic fluid to and fro vessels synchronously or asynchronously in relation to the rhythm of the heart with or without pressure application. A device having this combination of features is not taught by the combination of references, which each only deal with pumps that are supplied with power from sources external the body. Furthermore, it is respectfully submitted that there is no motivation for modifying the primary reference based upon the teachings of either of the secondary references to arrive at the presently claimed invention. There is nothing in the teachings of any of the references which suggests modifying the Heimes et al. pump so that it is not dependent on energy from outside the body.

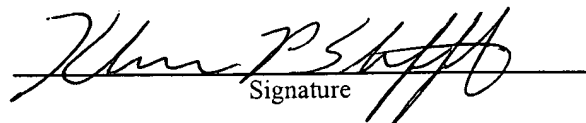
In view of these considerations, it is respectfully submitted that the rejection of claims 1, 2, 4, 6, 10 and 24 under 35 U.S.C. §103(a) over a combination of the above-discussed references is overcome and should be withdrawn.

Reconsideration and allowance of the present application are respectfully requested. In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed or if any additional fee during the prosecution of this application is not paid, the Patent Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on April 28, 2004:

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Name of applicant, assignee or  
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Respectfully submitted,

  
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